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Evaluating the readiness to transform towards a product-service system provider by a capability maturity modelling approach

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Abstract

A key capability for the future competitiveness of manufacturing companies is the development and delivery of integrated solutions. This comes along with a fundamental business transformation of the business model, structures, processes and behavior as well. However the majority of the initialized transformation efforts fail in the very beginning, because the factors and mechanisms of transformations are not fully understood. Although the concept of readiness is known as a crucial component and enabler for change processes, only few researchers have developed an assessment tool to measure companies' change readiness for upcoming transformation projects. Therefore, this paper addresses this issue and introduces a concept to evaluate the readiness to transform towards solution business into a product-service system provider.

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1. Introduction

Organizational change and the circumstances under which change occurs are of high relevance for both academics as well as practitioners [1]. Organizations, irrespective of their size, are more than ever required to adapt to an increasingly dynamic and volatile environment as the speed and intensity of change are continually increasing [2,3]. A study by KPMG [3] supports this point of view. According to the findings, the external driving forces creating a need for business transformation are increased competition from overseas and domestic rivals, industry consolidation, technological change, changing customer preferences and regulatory changes. The actual state of an organization is constantly challenged which creates the necessity to follow new approaches to increase its effectiveness throughout its business [4]. Through an intensive management of the change effort, the company can achieve or sustain its competitiveness [5].

The majority of change efforts fail already in the very beginning due to insufficient preparation within the business. Hence, people remain in their current comfort zones, unwilling to change the status quo [6]. In this context, change

readiness describes the degree to which members of an organization are disposed to participate in and support a certain undertaking [7].

But facing a transformation, a company not only has to consider the readiness or capability of its staff to adapt to and conduct the change but also organizational aspects. Especially important are high-order systematic organizational practices to improve underlying operating routines and capabilities [8]. This fact is even more important if organizations try to innovate their business model. Consequently, it is an essential facet of a successful transformation that the company is ready and well prepared for the upcoming change. One of these essential changes can be seen in today's manufacturing industry. The materialized product is losing its former prominence. Solution business (SB) in form of tailor made and business specific services complementing the product are gaining continuously more relevance. Integrated product and service offerings in form of product-service-systems (PPS) deliver value in use. Therefore this paper is focusing on the determination of change readiness of an organization transforming towards PSS as well as the demonstration of success factors of transformation process towards a product service system provider.

2. Theoretical foundation

While most researchers focus on the individual level and hence on the human side of change readiness and investigate change supportive behaviors and individual performances [17], this paper suggests analyzing change readiness on both sides the individual and the organization level to get a holistic insight into change readiness.

The concept of change readiness is determined by the individual change readiness as well as the organizational perspective of change readiness. The individual side of change readiness can be understood as the cognitive state that includes beliefs, attitudes and intentions towards change. It is thus a mental forerunner of either support for change or resistance against it. In detail change readiness of individuals can be divided in three aspects: cognitive, emotional and intentional readiness [9]. For example people with high decision latitude and highly challenging tasks are more likely to support an upcoming change effort [10]. The organizational readiness for change processes is inseparably combined with the analyzed individual change readiness of organizations. A result that underlines this inseparability is that employees try to stick to companies being similar to themselves in terms of the companies' inherent culture [14].

To make change readiness more tangible the components must be measureable and more precisely. Therefore it is necessary to analyze the content, the intended change process and its context as well as the specific attributes of the organization as a whole. These parts can be broken down to smaller units to build up the framework to analyze the organizational change readiness. With quantitative and qualitative techniques, readiness can be measured in a final step. While qualitative methods provide change related information, quantitative approaches offer unique advantages. Nevertheless, most quantitative approaches lack evidence of validity and reliability [15].

Therefore our assessment to evaluate the readiness to transform towards a product-service system provider is based on a Capability Maturity Model Integration (CMMI). Originally CMMI is a process model used for the purpose of process description, documentation and guidance for process improvement [17]. To ensure improvement processes CMMI can be implemented in continuous or staged representation processes. Switching between the two approaches is one possible way to implement change. Specific process areas in the organization are chosen and addressed to ensure the success of the implementation strategy. Furthermore small evolutionary steps (maturity levels) build the foundation for mature processes towards change [18]. The following describes the two established concepts of CMMI and the relevance for the later developed approach, followed by the concept of maturity levels. The staged representation of the CMMI focuses on maturity of the required steps. It distinguishes between five levels of maturity, ascending from 1 to 5, from

initializing to optimizing. At the initial level, neither the process program nor the process areas are implemented yet. At the second level, process areas are implemented to guide project and process management practices. This is followed by the third level in which the adoption of several new process areas at the defined level is made. At the fourth level, the product and processes are quantitatively controlled. At the last and fifth level, the company-wide focus lies completely on process and project improvement [19]. Maturity levels indicate the process capability and additionally contain key process areas in which the importance of setting goals that were discussed earlier and are set and achieved [18]. The goals can be generic or specific. Goals indicate the scope, boundaries and intent of each key process area. While specific goals relate only to specific process areas, generic goals are common to multiple process areas throughout the model and help determining if the process area has been institutionalized or not [17].

It should be noted that the attempt to skip maturity levels during the process can be counterproductive, because an inferior level is a necessary base for the superior one. That is why improvements are more likely to fail when a level is skipped [18]. Besides others the most important advantages of the staged process are the predefined path and return on invest data and the focus on organizational improvement. In the staged process must be observed that the later discussed maturity levels are not misused as predefined goals stopping the improving process [19].

In contrast to the staged CMMI the continuous approach provides greater flexibility and sequenced priorities and establishes a life cycle view but especially the relationships and dependencies between the stake-holders are not as clear as in is in the staged process. In general the continuous approach focusses on the characterization of inherent processes of an organization relative to an individual process area. This means that the continuous approach makes it possible to focus on specific areas of an organization. Therefore the way progress is measured is different in this representation. Improvement is measured with capability levels being divided into four steps from incomplete (0) to defined (3). The intermediate stages (2 and 3) correspond to the levels of the maturity levels [20, 21].

Merging the maturity levels of the staged representation with the capability levels of the continuous representation leads to a capability scale consisting of six levels from 0 to 5: (0) incomplete, (1) performed, (2) managed, (3) defined, (4) quantitatively managed and (5) optimized. The model introduced hereafter will rely on the principles of continuous representation (see figure 1).

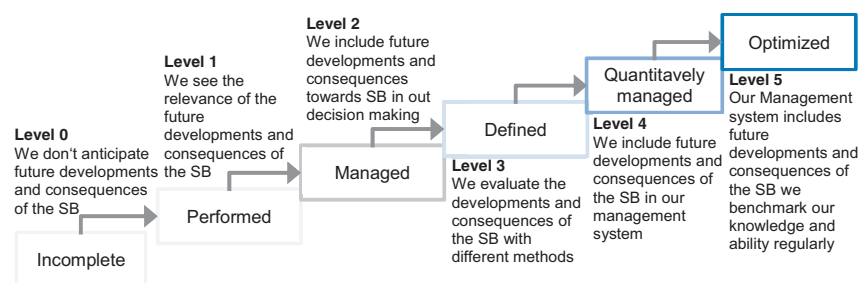


Fig. 1: Maturity levels by taking the example of *need for change towards solution business* [17,18]

3. Assessment framework for the measurement of transformation readiness towards product-service-systems

The following framework is based on a review of relevant published work on the topic of transformation readiness. From the mentioned review, the gap of a missing model to assess the readiness was identified as relevant to the present topic of study. The approach is meant to foster and expand the overall understanding of organizational change as a whole and change readiness in particular. Throughout the process, the following analysis focuses on the elaboration of existing concepts. Therefore, the work of acknowledged authors in the field and articles in internationally respected top journals were examined to spot the key elements (19) of transformation readiness. These 19 elements are highlighted in italic and will be described in the following. Finally the elements can be found in the developed assessment in figure 2.

The perception of a reasonable or even inevitable need for change is necessary for the process of entering the solution business. On this occasion the understanding of the *need for change towards solution business (SB)* is the first element of the later described approach. Various authors stress the importance (e.g. Armenakis, Harris & Mossholder [22]), for an organization to realize that in order to remain competitive certain future developments require adjusting the present organization to the changing environment. In order to know whether adjustments need to be made, managers have to be aware of the current state of the organization and understand the potentials of the organization and which weaknesses might cause trouble in the future. Kotter [6] and Eby et al. [11] suggest that not only the organization has to anticipate the need for change, but also the members of the organization have to be convinced to make sure that actions according to expectations take place. Moreover, Kotter [6] points out that for an upcoming change process the organization needs a picture of the future and a superior goal to which all activities should contribute. The maturity levels of this element (*need for change towards solution business*) is exemplary shown in figure 1.

In this way single activities are part of a larger system or strategy which gives them additional meaning by contributing to something bigger being the second key element for change readiness. At their best the *willingness to become a solution provider* must be defined in throughout the whole organization. Accordingly, the use of a *SB oriented vision* which merges the single plans and directives with one another helps to guide the organization towards the transformation process (e.g. Buono & Kerber [23]). Furthermore *Solution based goals* foster organizational change through explicitly defining the desired outcome.

Additionally, as Herscovitch and Meyer [12] state all concerned members of the organization need to be committed to change in order to make it work. Especially the commitment of the top management is important for successful transformation processes. *Leader committed solution business* as well as *employees commitment towards solution business* is necessary to make people work as hard as they needed to succeed and bear more workload for the upcoming challenges of the SB. Among the members we propose to distinguish between staff employees and leaders of the organization. While the employees' commitment is

important for concrete tasks regarding their respective area of expertise, *the leaders' commitment* is necessary for aligning the whole process (e.g. Anderson & Ackerman Anderson [13]).

The *current level of solution business (SB)* shows how distinct the status quo was analysed and how strong competencies are already focusing on the development of product service systems. A clear picture of the status quo is the enabler to identify future opportunities and goals. The knowledge is of great importance when organizations try to describe the future target state. The *planned level of SB* reflects the knowledge about the target state including the occurrence of future product service systems. Both aspects, the current level of SB as well as the planned level of SB, has to be transparent to the members of an organization to discover concrete potential advantages that legitimates the transformation.

Another important aspect on the way to become a solution provider is the financial aspect. *Financing for SB* requires investing in new resources and infrastructures that accelerates the desired outcome towards the SB or defend against a potential financial loss during the period of transformation. Therefore, it is important to be able to support necessary reforms financially. This view is also supported by Stevens [7] who claims that an organization needs to have certain financial resources when it wants to conduct a change.

The idea of a change agent is analysed in numerous studies. He is considered to be essential in a transformation process because of his function to connect and moderate the management activities as well as the eventual consequences for the employees (e.g. Cameron & Green 2012 [24]). Current research presents change agent as a very broad term. We found that it better matches the readiness assessment on an organizational level to take a similar but slightly different approach regarding organizational roles. Therefore, following the change agent is defined as the role of a sponsor that has superior authority and supports and represents the change process throughout the organization to ensure the staff's target-oriented work by *sponsorship for SB*.

To direct and lead all efforts into a certain direction, an organization requires superior structures and processes. For this reason, *solution business governance* is a decisive capability to implement the solution business in the way they were planned. Without this capability, the implementation process might differ among the units of the organization since guidance is missing.

Furthermore, people in charge of a transformation process need to take *responsibility* for their actions and decisions. Consequently, it is extremely important that the areas of responsibility are distinct and explicitly defined in order to address tasks, success or failure to the right person.

The whole change process should be supported by the creation of an *implementation plan towards SB*. Milestones help to document the progress of strategic programs. An implementation plan provides a systemized course of action to follow whereby the transformation process can be observed and rated according to agree upon procedures. The detailed evaluation results offer the possibility to make necessary adjustments or modifications during an ongoing process to ensure its success.

To effectively and efficiently steer the quantity of tasks and give a framework to the milestones of the implementation plan *project management* is needed to realize and implement a temporary program designed to improve the overall performance or to meet certain goals. Therefore, an organization requires crucial methods, tools and knowledge to be capable to make the transformation process work and navigate it into the desired direction by using project management tools.

While the change process is running, unexpected challenges appear that could cause a negative impact on the change process or even result in failure. In order to avoid such complications, the transformation process should be continuously observed and evaluated. In doing so, possible problems are pointed out and adjustments can be made. Therefore *solution business performance measurement* can be an essential part to carry out the solution business. In this case, it is reasonable to assume that human resources in form of *personal SB competence* are crucial to successfully build a team that controls the effort of becoming a solution provider. Consequently, we suggest that a critical element of the change implementation is the capability to execute and manage the transformation. When a person in charge has already gained experience with transformation projects, it is considered to be favourable for successfully implementing changes.

A new project always needs its own resources, which means that the organization needs some free capacities. They must be big enough to ensure that the change project gets internal support which means that supportive people who make additional *effort* are able to react flexible towards obstacles.

Transformation efforts and benefits are often hidden from the majority of the people or they cannot see the big picture. This results in employees not knowing about the ongoing processes and how to support them. A very effective tool for spreading information and gaining support is *communication*. Many researchers note its importance for change efforts, as communication “is a necessary process for creating a change capability” [25]. Through purposeful communication negative mind-sets and reservations can be eliminated to facilitate the change process.

Lastly, we want to emphasize that *leadership* is indispensable for any transformation (e.g. Anderson & Anderson [13]). Leadership in general describes the process of influencing people to gain support and accomplish a common goal. An organization requires leadership in every step of its life cycle, but leadership during transformations is special as leaders have to use their social influence to align people’s minds for the purpose of the transformation effort.

The presented results of our review were then systematically assembled with the help of the CMMI and the capability levels. CMMI was chosen because of its solid reputation, combinability with other technologies and wide range of activities. Moreover, it considers corporate targets as well as business needs and thus provides a conceptual structure for improving management and configuration in a stringent and consistent way towards solution business.

4. The Business Transformation Readiness Assessment

4.1. Configuration of the key dimensions and elements

The Business Transformation Readiness Assessment (BTRA) is grouped in four superior categories (see figure 2) to assess the essential aspects of transformation readiness. The classification was done according to a reasonable stepwise approach. First, there must be a change strategy followed by a concrete design and then second, the execution of the developed plan. Those four dimensions assess the readiness of an organization to a planned transformation and capability of an organizational structure to succeed with a change effort. Within these four dimensions the described 19 factors with six different levels of capability each. Hence, the scale is based on the continuous representation of the CMMI. Evaluating all variables leads to a profound knowledge of the state of readiness and facilitates detecting strengths and weaknesses of the current set up. To test the quality of the developed approach, it was used in numerous projects and then evaluated and verified.

To begin with, the dimension *strategy* will be discussed. Overall, the transformation strategy defines the vision as well as the goal for the transformation towards PSS and establishes a common understanding among all stakeholders. Therefore the need for change towards SB and which consequences will be faced by doing so is the first element towards PSS business. Additionally, the willingness to get into the SB to make necessary modifications within the organization and the processes as well as acting according to changing circumstances and develop new potentials is one crucial element of strategy. Furthermore, the approach rates whether there is a SB vision about the future progress of the organization. Aligning this with vision goal setting is an essential part of strategic planning. The developed approach rates the clarity and tangibility of pre-established SB goals within the organization. The last determinant of the strategy dimension is the commitment of the top management which tries to unveil the level of capability to actually execute the change strategy. When the strategy is set, the process of transformation is designed. Doing so current and future potentials are analyzed as well as transformation plans and processes are developed.

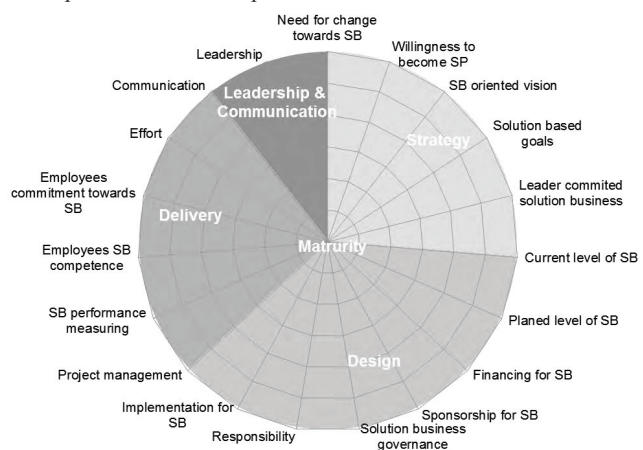


Fig. 2: Dimension and success factors of change readiness (own representation)

The second dimension of the approach –*design*–consists of seven determinants. Firstly, the approach evaluates how aware employees are of the status quo of the solution business and if they have the knowledge about the target state. Both aspects have to be clear to members of the organization to discover concrete potential advantages and chances in the future. As discussed earlier in the literature review, the capability of an organization to execute a change process depends on mobilizing financial resources that being provided for SB and how efficiently they are employed. But not only money is required to support the transformation process, also people need to sponsor the process by fulfilling clearly defined SB organization roles. In those roles they support internal projects, ensure progress and represent superior authorities and must be willing to change their behaviour. Another important aspect of the design phase is governance. For the purpose of measuring transformation readiness it is of particular interest whether there are superordinate structures and processes that govern the changes which can be adjusted if necessary. To guide the change process, responsibilities must be clearly defined to ensure that success and failure can be elaborated and assigned to the right person. The final aspect of the design phase is the presence of an implementation plan to implement the SB into the companies.

The third dimension of the business transformation readiness assessment is called *delivery*. At this stage preparation and planning are put into practice, meaning that the transformation plan is implemented and various processes are coordinated. Delivery consists of five variables. The first variable is project management. The approach is designed to measure whether the organization is capable to manage PSS projects successfully and knows the required methods and tools. The second aspect of the delivery stage is to measure the SB performance regularly and in short intervals. Another relevant factor for the readiness of an organization is the employees' competence of change management processes. The more knowledge in the field of PSS they already acquired, the better the process can be supported by the staff. But employees should not only have profound knowledge, they also need to be well committed to become a solution providing company. This means that employees have to be inspired and actively support the ideas, effects and consequences of the SB. The ultimate determinant of delivery is effort. This final variable of the delivery phase indicates how flexible the organization adjusts or redirects its efforts and manages its capacities for internal projects.

The fourth dimension of the developed approach is called *leadership and communication* which are corresponding variables. Leadership and communication facilitate the transformation through all of the previously mentioned stages. Leaders should be both convincing and consistent in its communication of the future developments in the SB to align and motivate the staff though the process. The capability of an organization to succeed in transforming their original business into PSS business requires considering all of the mentioned dimensions and their respective characteristics.

4.2. Validation of the BTRA

In order to validate the quality and utility of our model,

it was used in two transformation projects in the manufacturing industry. In both cases the change readiness were analyzed at the beginning of the project by using our assessment. Therefore the senior management was asked to evaluate the maturity level of the 19 relevant factors.

Case 1 is based on the transformation of a company that is running its business in the goods industry supplying rail vehicles. The reasons to consider the transformation were insufficient results of the product and service business. To achieve positive results, a transformation was performed with the support of the CEO/senior manager and under guidance of a project team which is also illustrated by the shape of the graph in figure 3. By consideration the strategic readiness of the analyzed company towards PSS business the company of case 1 did well in developing a plain vision about the change and its desired outcomes as well as analyzing the current status of the business. Furthermore, part of the design section was a suitable implementation plan and appropriate governance, sponsorship and financing. In contrast figure 3 below expresses the rather poorly prepared delivery of the transformation. Despite a bad rating in delivery, the company achieved its set goal which leads us to derive support for the importance of leadership and a clearly defined vision. Given the guidance throughout the transformational process, the company worked together towards a common goal. In addition, the case proved that it is of great help to show employees what benefits the change will bring to them and the company.

Case 2 is about a German company operating in the sector of mechanical engineering and construction. This market became lately more and more competitive due to new entrants, especially from China. The investigated company considered a transformation in order to maintain its competitiveness in this fiercely competitive market. The results of the analyzed questionnaire are presented in figure 4 below. It shows that only very low capability levels are reached in the leadership and communication stage as well as the strategy stage. On the contrary, the design and delivery stages have high peaks in project management and the allocation of responsibilities. Here, the company reached a capability level of three for two characteristics (project management and responsibilities), which is the highest overall in the cases we reviewed. Nevertheless, the company in case 2 failed the transformation

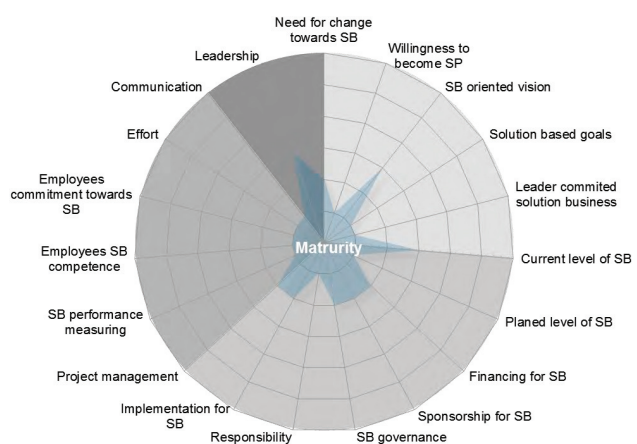


Fig. 3: Assessment profile of business case 1 (own representation)

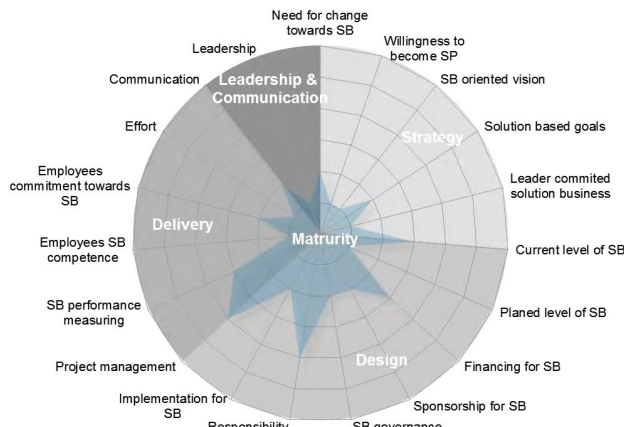


Fig. 4: Assessment profile of business case 2 (own representation)

because they lacked a consistent goal and vision. Therefore, we repeatedly found that goal and vision as essential and mandatory for any transformation effort while other components like project management or personal competence seem to be less important for succeeding in transforming a business. This leads to the proposition that not all aspects should be equally weighted but careful differentiation with respect to their influence on a transformation's outcome should be given.

5. Summary

In this paper an approach was presented that evaluates the existing capabilities of an organization to successfully transform the chosen areas. Thereby, critical areas of the transformation capabilities and recommend strategies that eliminate discovered deficits and potentials were identified. In addition, strengths were highlighted to provide an overall view of the organizational capabilities. Crucial for the success of a transformation is to develop strategies that assist in achieving company-wide readiness. Therefore, it is necessary to know which strategic aspects to address. Bases on a CMMI theoretical framework the Business Transformation Readiness Assessment was developed and tested to assess companies' readiness for transformation towards solution based business.

As a major conclusion it can be stated that a company's specific change readiness has a significant influence on the success of the transformation towards solution business. As shown in the two cases and validated in other comparable transformation projects, it was found that clear and operationalized goals and a clear vision of the changes have a major impact on the success of the transformation (Case 1). Lack of skills in the implementation at the beginning of a transformation project, however, can be better balanced during the implementation of the transformation. To strengthen the meaningfulness of the here presented assessment approach more use cases have to be approved in the future.

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